

Name: \_\_\_\_\_

Date: \_\_\_\_\_

## A2CC: Margin of Error

Every confidence interval is of the form: estimate  $\pm$  margin of error.So, for a 99% confidence interval for  $p$ , the margin of error is  $2.576 \sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$ .

sample proportion (%)

For a 95% confidence interval for  $\mu$ , the margin of error is  $1.96 \frac{\sigma}{\sqrt{n}}$ .

sample means

For a 90% confidence interval for  $\mu$ , the margin of error isThe margin of error shows us how accurate we believe our estimate of the parameter (either  $\bar{x}$  or  $\hat{p}$ ) is based on the variability of the estimate.

The margin of error is always half the length of the confidence interval.

Exercise # 1: A random sample of 50 people was taken and 38% of them listed soda A as their favorite. If constructing a 95% confidence interval, what is the margin of error?

construct the C.I.

38% of 50

$$.38 \times 50 = 19 \text{ people}$$

(Prop Z-test)

$x=19$   
 $n=50$   
 $C=.95$

NORMAL FLOAT AUTO REAL Radian HP

1-PropZInt

(.24546,.51454)

$\hat{p}=.38$   
 $n=50$

C.I. is

$$24.546\% - 51.454\%$$

sample proportion

$$\begin{aligned} \text{MOE} &= \frac{.51454 - .24546}{2} \\ &= .13454 \\ &= 13.45\% \end{aligned}$$

Exercise # 2: If a sample of three dozen jumbo eggs had a mean weight of 69.7 grams and the population of eggs has a sample standard deviation of 3.2 grams, what is the margin of error for a 99% confidence interval?

## Sample Proportion Confidence Interval

NORMAL FLOAT AUTO REAL RADIAN MP

1-PropZInt

x:38  
n:50  
C-Level:.95  
Calculate

# of people that do what we are surveying

Sample size

95% confidence interval

NORMAL FLOAT AUTO REAL RADIAN MP

1-PropZInt

(.64162,.87838)  
 $\hat{p}=.76$   
n=50

64% → 88%

Sample proportion

We are 95% confident  
the true value is between

NORMAL FLOAT AUTO REAL RADIAN MP

**ZInterval**

Inpt:Data Stats

 $\sigma$ : $\bar{x}$ :0

n:50

C-Level:.95

Calculate

standard deviation

mean

Sample size

Confidence interval

NORMAL FLOAT AUTO REAL RADIAN MP

**ZInterval**

(58.337,61.663)

 $\bar{x}$ =60

n=50

95% confident  
that the actual mean  
is between  
58.3 and 61.7



Exercise # 3: A population has a standard deviation of 37. If a researcher is designing a study so that a 95% confidence interval for the distribution of sample means has a margin of error less than 5, what is the smallest sample size that can be used?

Exercise # 4: The heights of 16 year old American males are normally distributed with a mean of 65.3 inches and a standard deviation of 4.2 inches. How large a sample would be needed to estimate the mean  $\mu$  to within  $\pm 1$  inch with 99% confidence?

When determining sample size for intervals for population proportions, we always use  $p = .5$  if we have no information about  $p$ . Otherwise, we use the suspected value.

Exercise # 5: It is believed that 35% of all voters favor a particular candidate for office. How large a sample is required to estimate the proportion of voters in favor of the candidate to within  $\pm 3\%$  at the 95% confidence level? How large would it have to be if we had no idea what the percentage of voters who favor the candidate was?